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LOCKHEED MARTIN



FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

**NASA RESEARCH ANNOUNCEMENT
CONTRACT NAS8-39929
LOCKHEED MARTIN ASTRONAUTICS / NASA MSFC**

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FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

SUMMARY

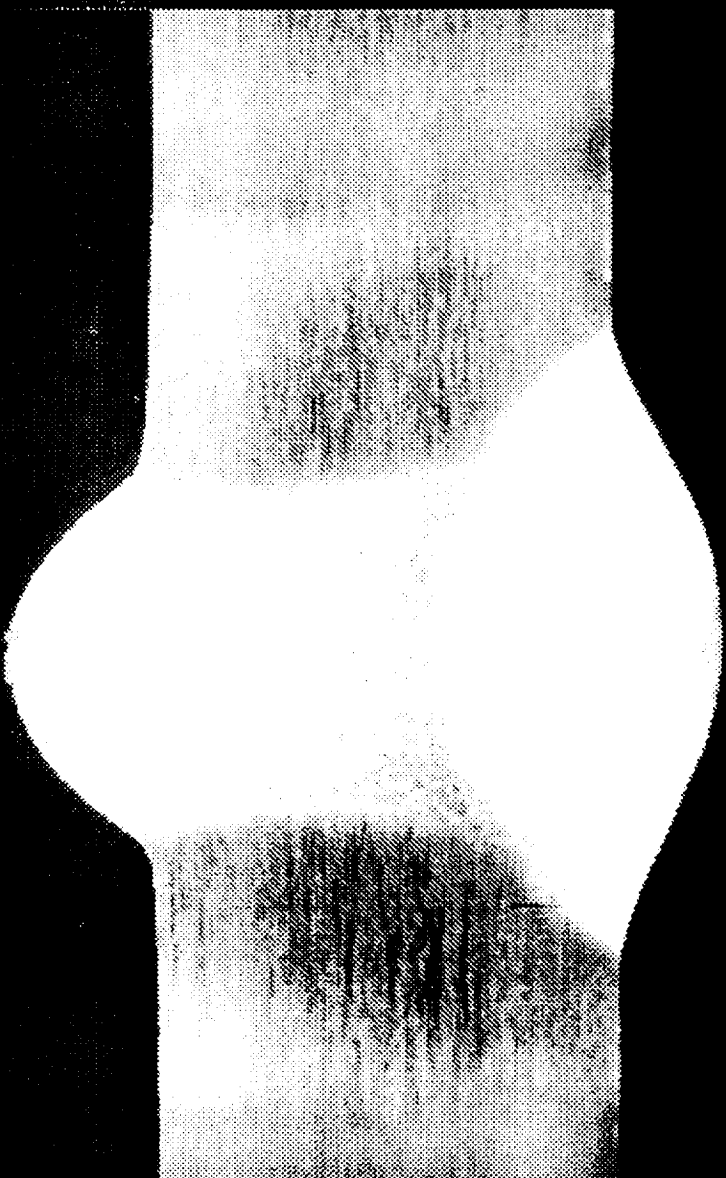
- INTRODUCTION
- OBJECTIVE
- APPROACH
- FILLER WIRE CHEMISTRY FORMULATION
- WELD EVALUATION
- DOWNSelect
- DOWNSelect WELD EVALUATION
- CONCLUSIONS

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FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

INTRODUCTION



0.320" ± 0.001 2195 PLATE-TO-2195 PLATE ER2319



FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

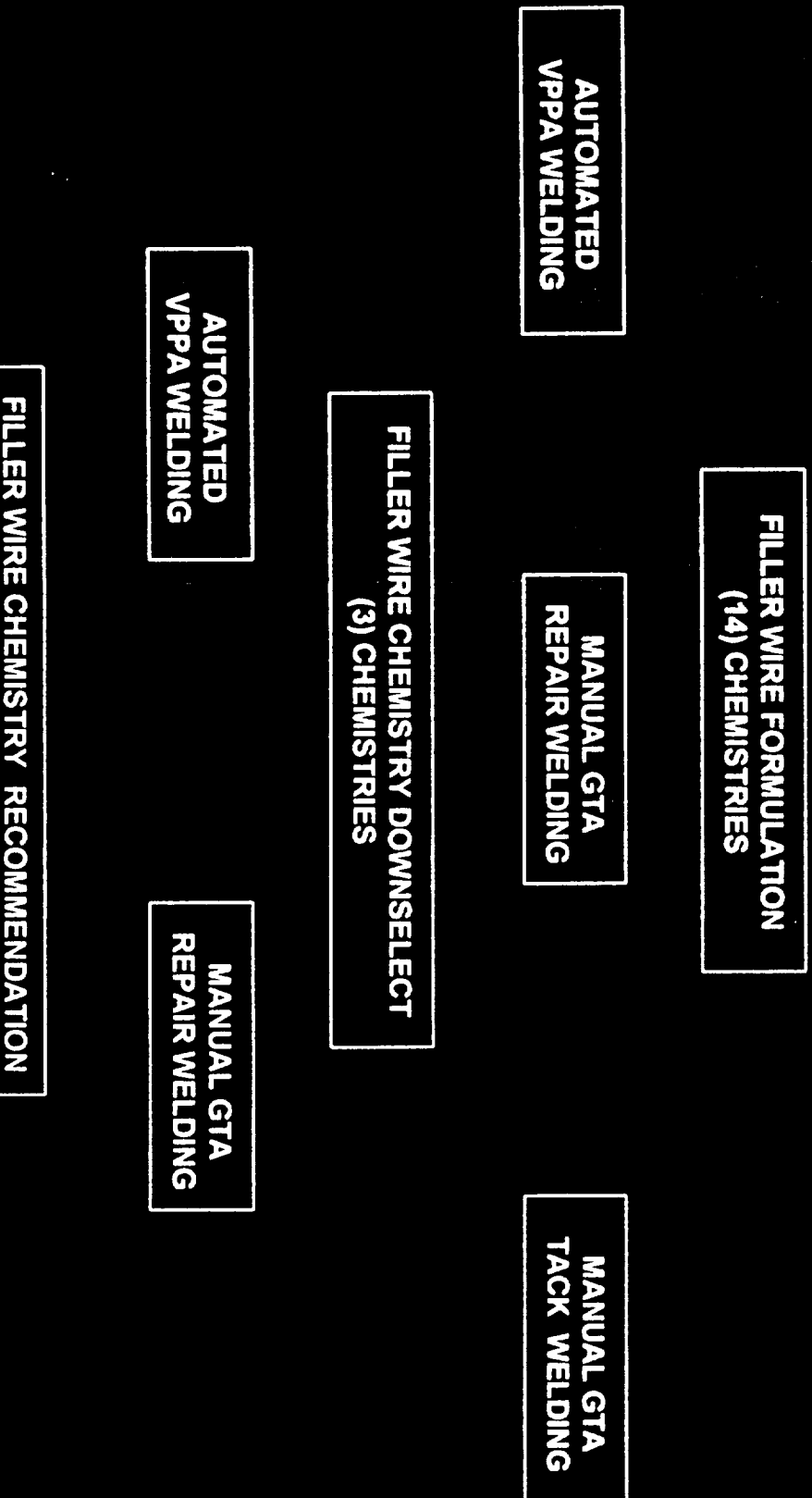
OBJECTIVE

IDENTIFY AN Al-Cu BASED FILLER WIRE CHEMISTRY WHICH REDUCES WELD CRACK SUSCEPTIBILITY IN 2195 ALUMINUM-LITHIUM WELDS AND REPAIR WELDS ALONG WITH PROVIDING ADEQUATE MECHANICAL PROPERTIES.



FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

APPROACH



FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

FILLER WIRE CHEMISTRIES

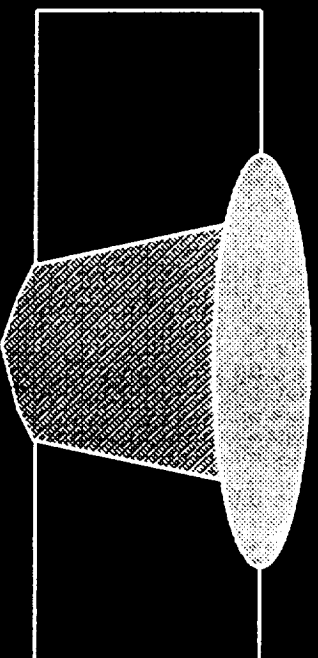
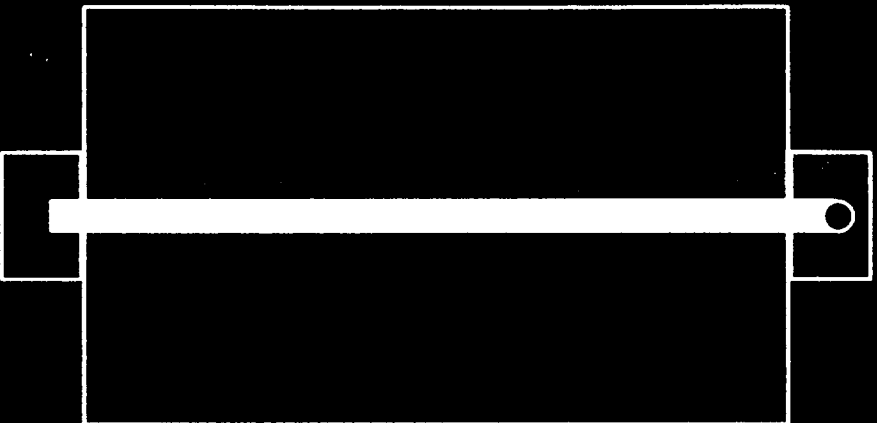
- (8) DOE CHEMISTRIES Cu, Li, Mg, Ag, Zn, Mn, V, Ti, Zr
- 2195 CHEMISTRY
- (5) 2319 VARIANT CHEMISTRIES Cu, Sc, Zr

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM WELDING

- AUTOMATED VPPA WELDING
- MANUAL GTA REPAIR WELDING
- MANUAL GTA TACK WELDING

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

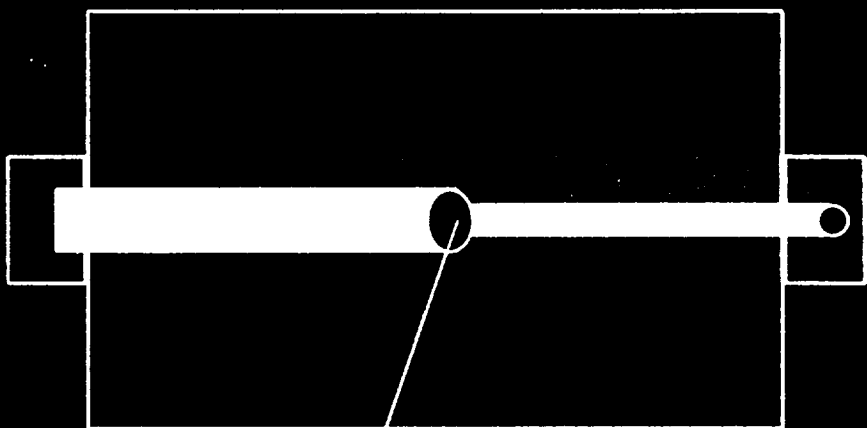
VPPA WELDING



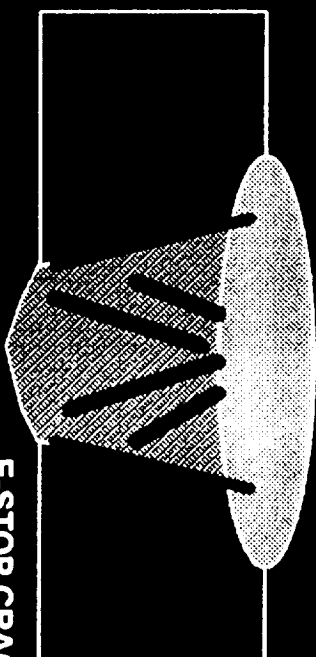
- (2) 16" LONG TEST PANELS WELDED
 - (3) RT AS-WELDED TENSILES
 - (3) RT SHAVED TENSILES
 - (2) RT J1c CENTERLINE
 - (2) RT J1c FUSION LINE
 - (3) SCC
 - (6) MET. SAMPLES

0.320"t 2195 PLATE-TO-2195 PLATE

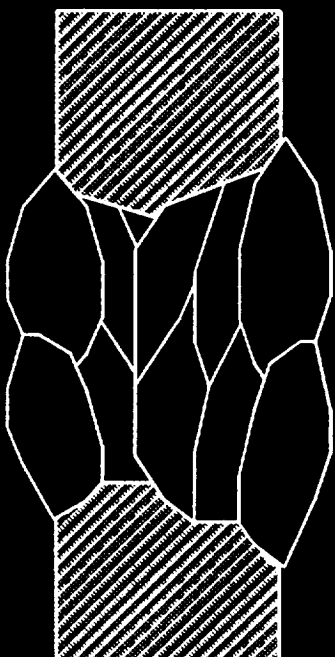
FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM MANUAL GTA REPAIR WELDING



VPPA WELD
COVER PASS
WELD
E-STOP



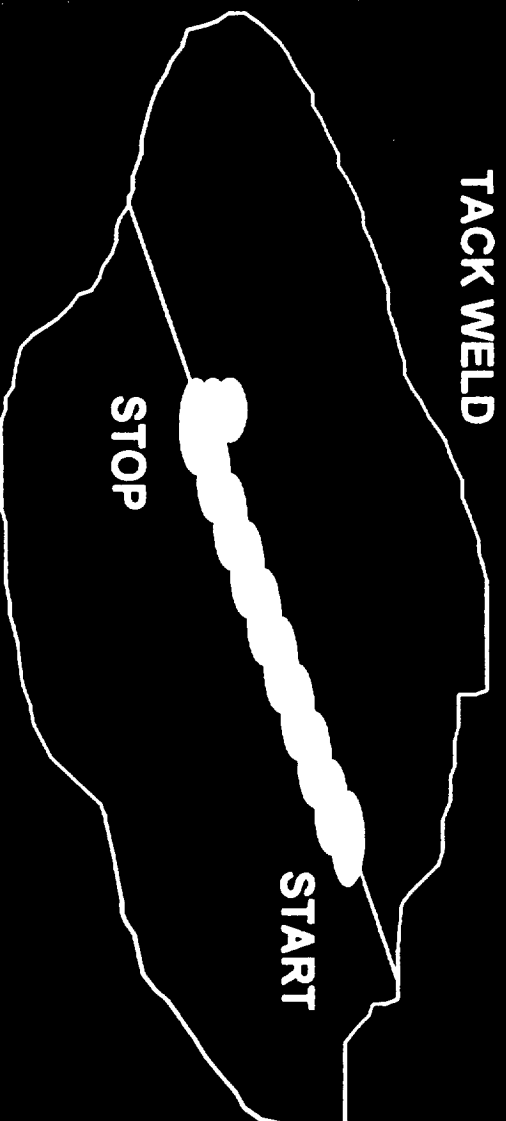
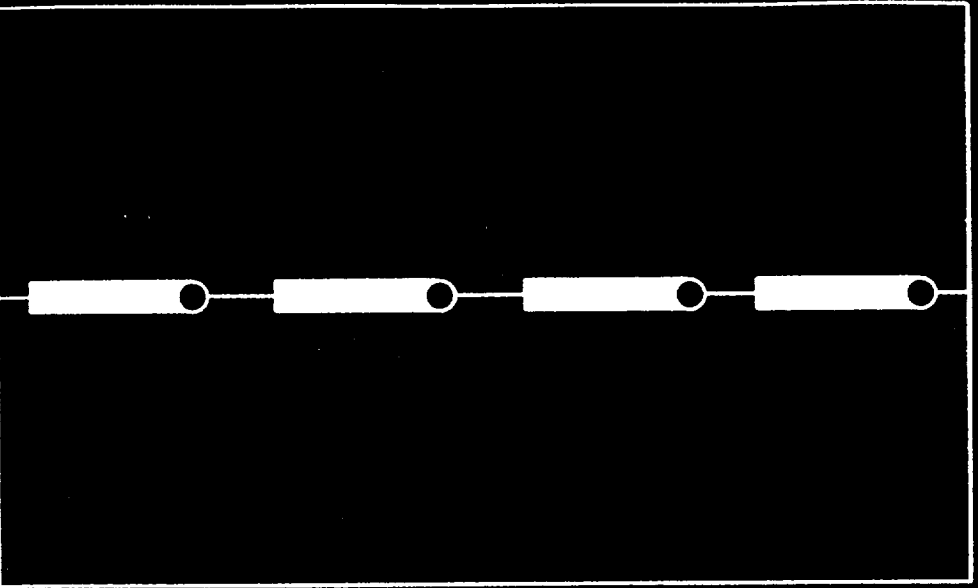
E-STOP CRACKING



TWO SIDED REPAIR WELD

0.320"t 2195 PLATE-TO-2195 PLATE

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM --- **MANUAL GTA TACK WELDING**

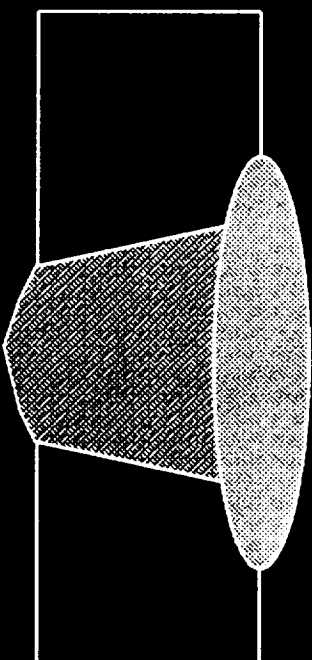
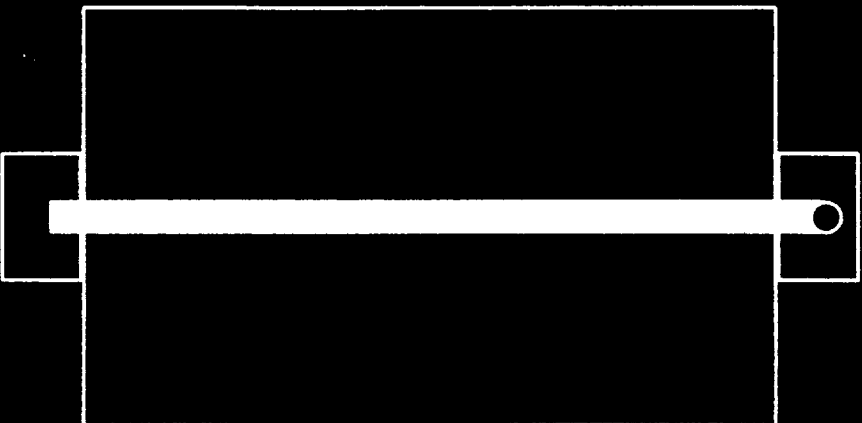


0.320"± 2195 PLATE-TO-2195 PLATE

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM
FILLER WIRE CHEMISTRY DOWNSELECT

(3) Filler Wire Chemistries Cu, Ag, Zn, Mg, Ti, Zr

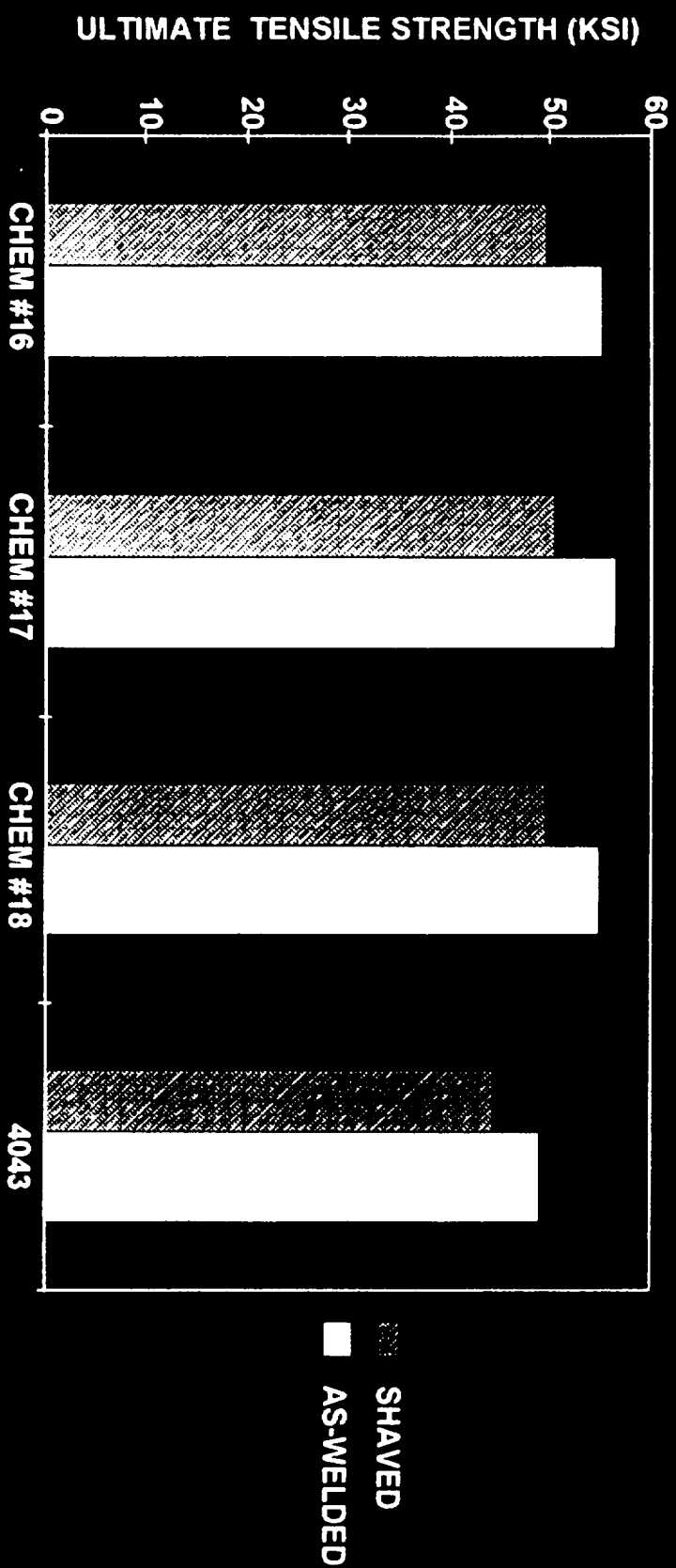
FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT VPPA WELDING



- (2) 16" LONG TEST PANELS VPPA WELDED
 - (3) RT AS-WELDED TENSILES
 - (3) RT SHAVED TENSILES
 - (3) RT J1c CENTERLINE
 - (3) LN2 J1c CENTERLINE
 - (3) SCC
 - (6) MET. SAMPLES

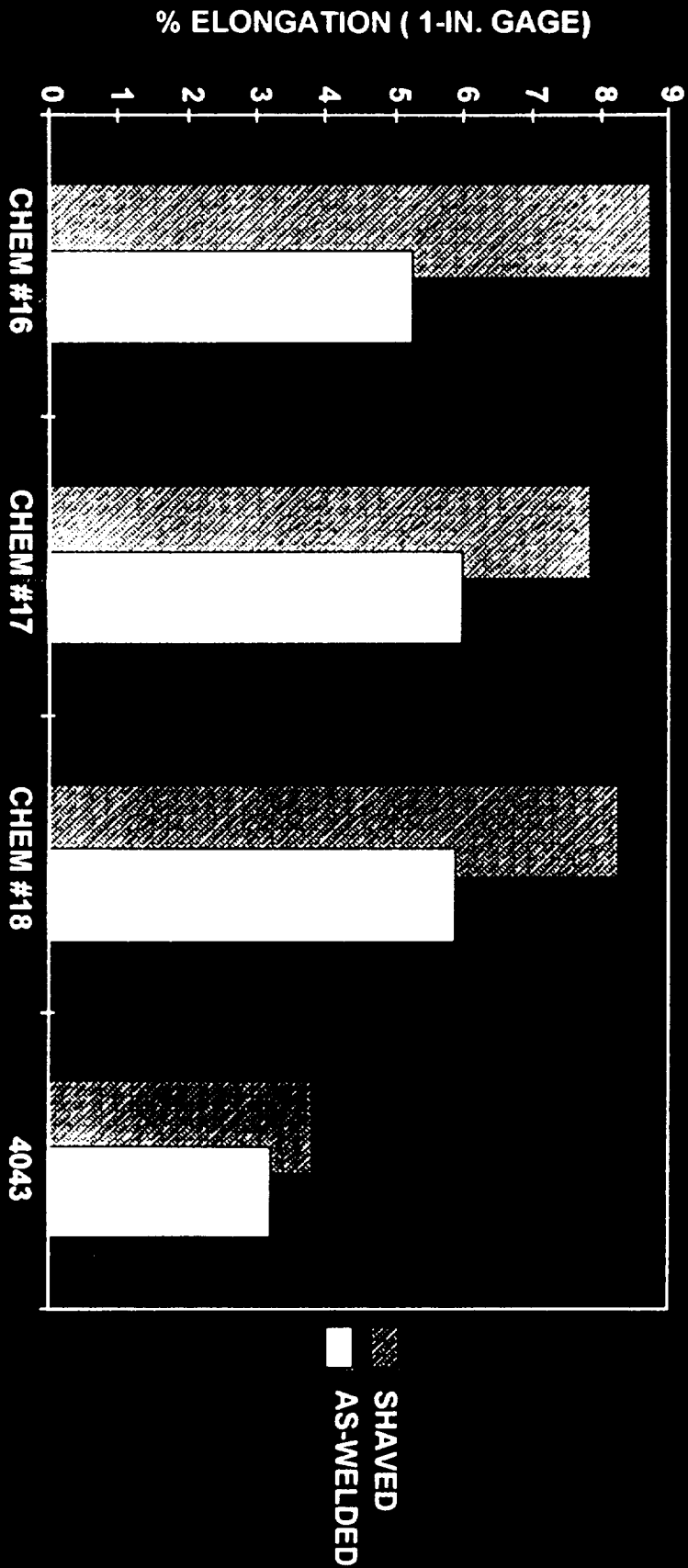
0.320"t 2195 PLATE-TO-2195 PLATE

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT VPFA WELDING WELD ULTIMATE TENSILE STRENGTH



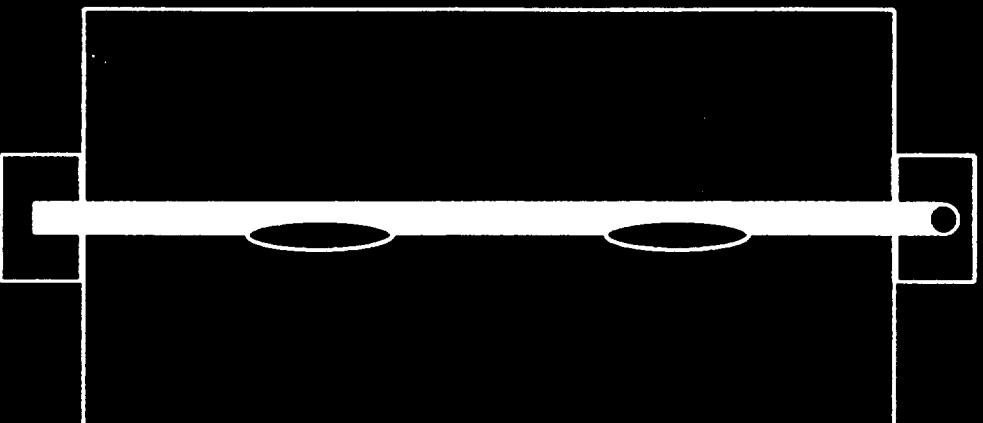


FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT VPPA WELDING WELD ELONGATION

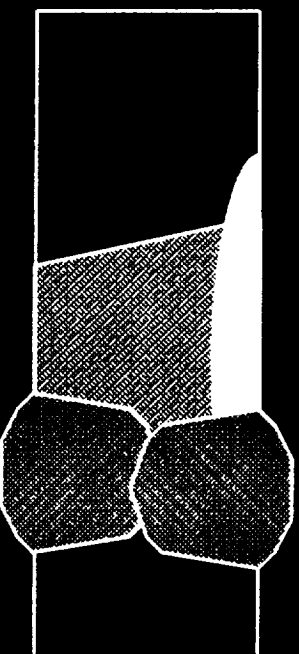




FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT MANUAL GTA REPAIR WELDING



0.200"± 2195 PLATE-TO-2195 PLATE

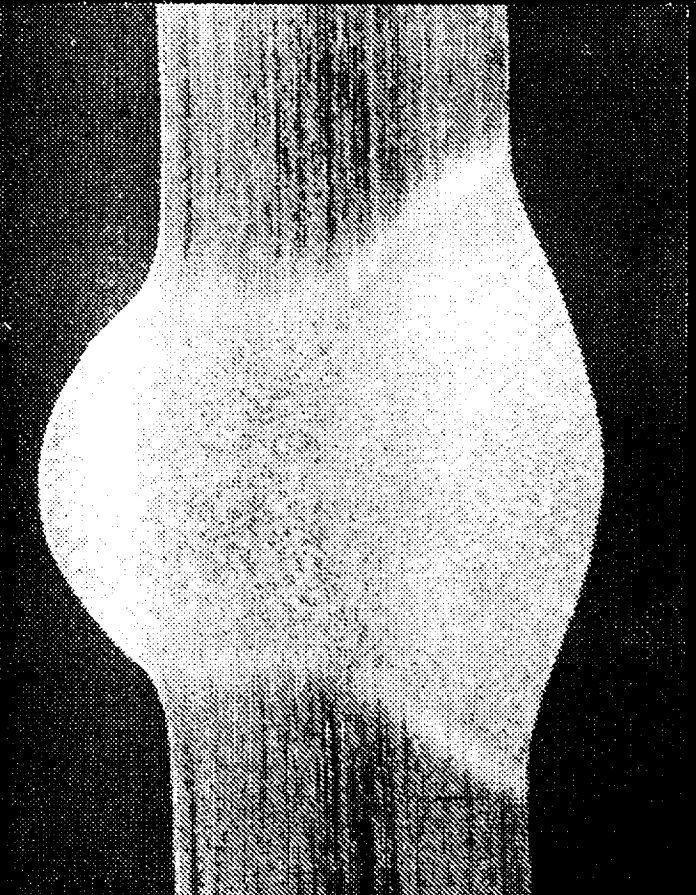


- (2) 24" LONG TEST PANELS VPPA WELDED
 - (4) RT SHAVED TENSILES
 - (4) LN2 SHAVED TENSILES
 - (3) RT J1c REPAIR FUSION LINE
 - (3) LN2 J1c REPAIR FUSION LINE
 - (3) RT J1c VPPA FUSION LINE
 - (3) LN2 J1c VPPA FUSION LINE

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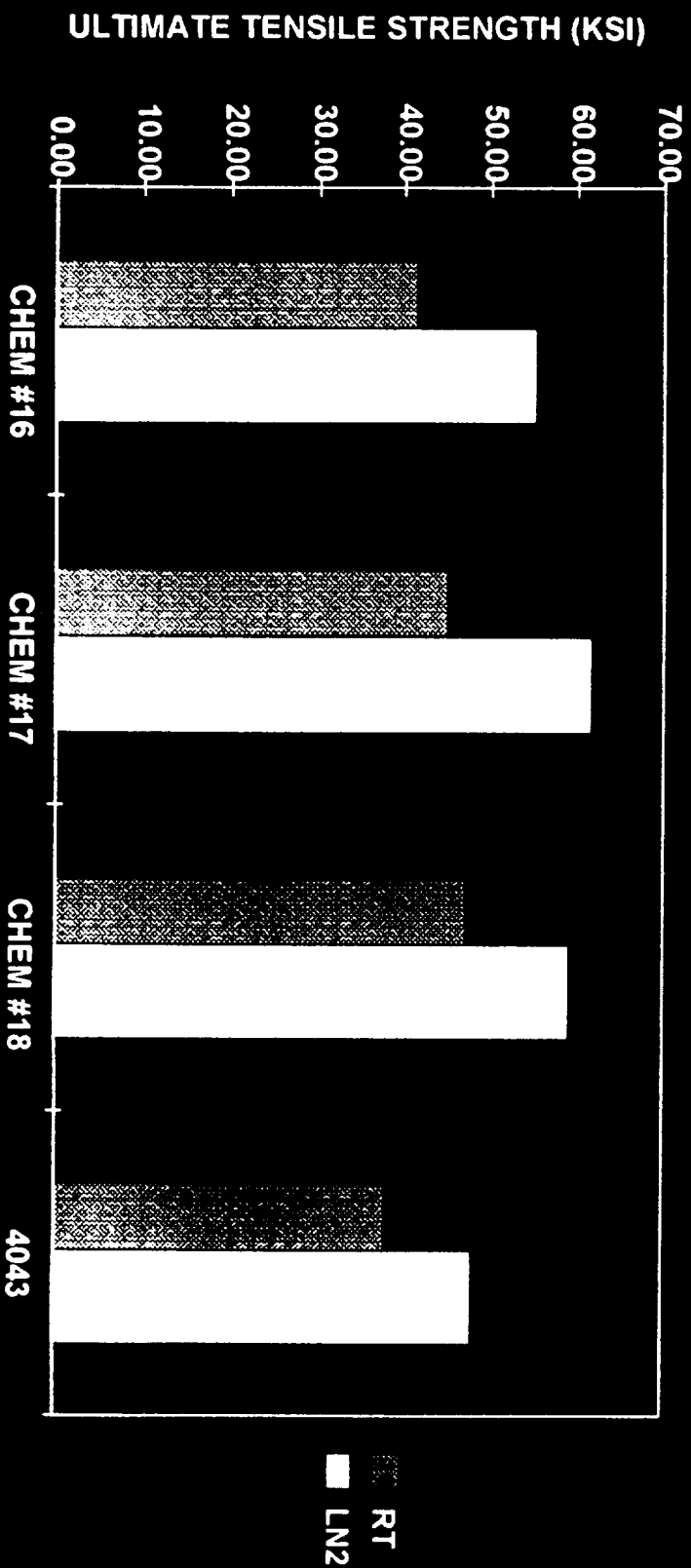
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FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT MANUAL GTA REPAIR WELDING



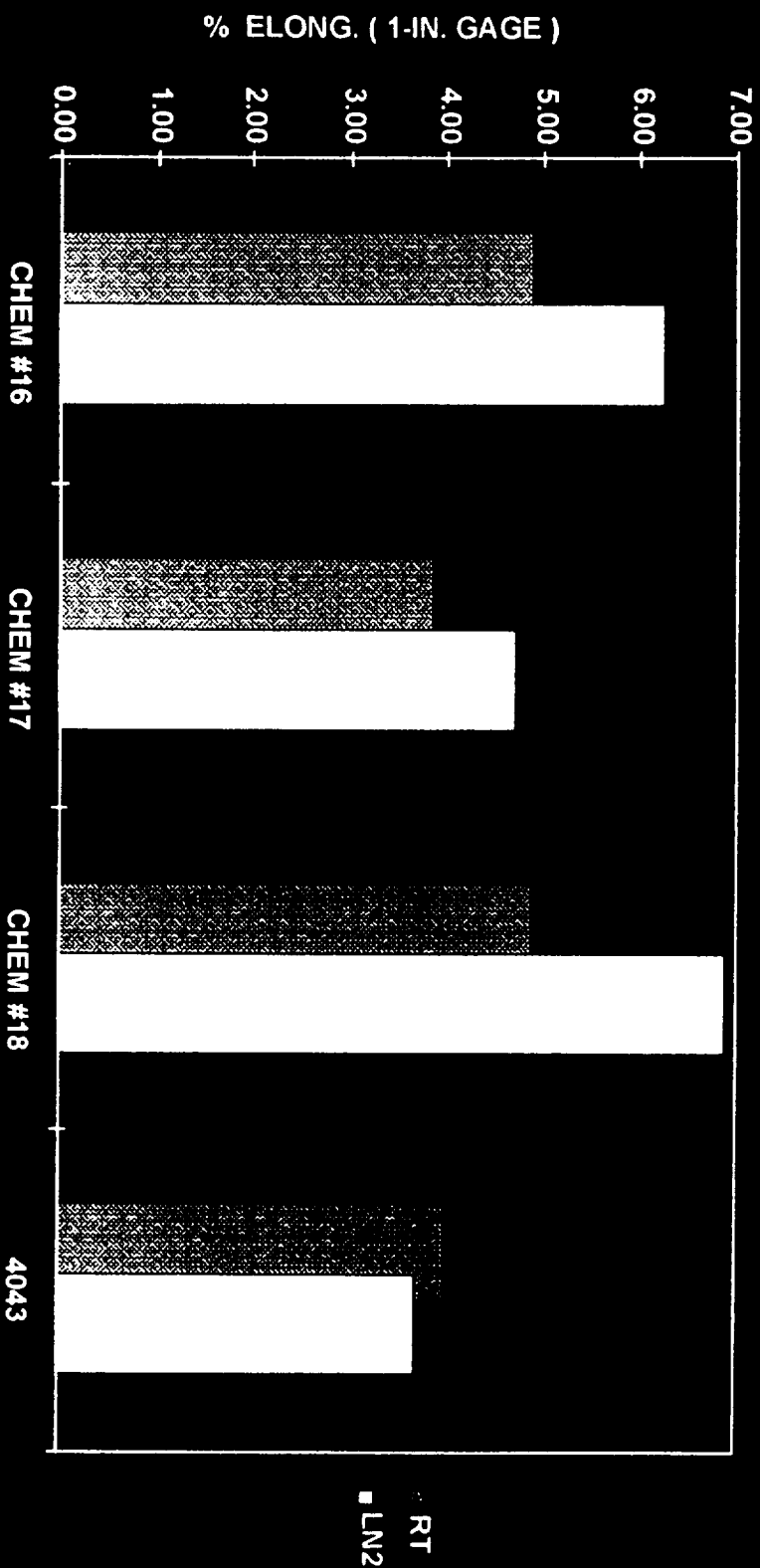
0.200"t 2195 PLATE-TO-2195 PLATE VPPA WELD

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT MANUAL GTA REPAIR WELDING REPAIR WELD ULTIMATE STRENGTH





FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM DOWNSELECT MANUAL GTA REPAIR WELDING REPAIR WELD ELONGATION

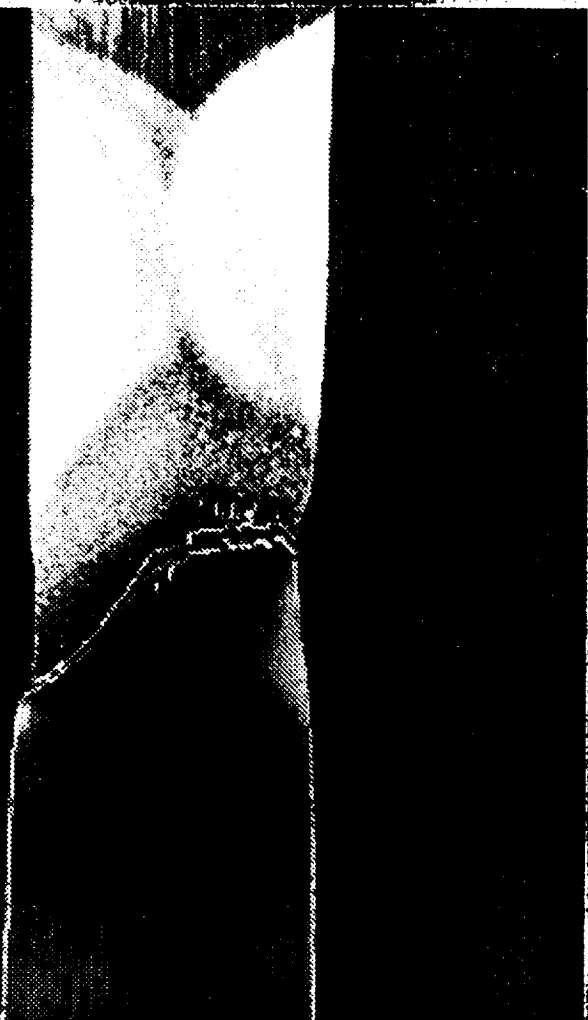


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FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

DOWNSELECT MANUAL GTA REPAIR WELDING



0.200" t 2195 PLATE-TO-2195 PLATE R5 GTA REPAIR WELD



FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

FILLER WIRE CHEMISTRY

CONCLUSIONS

FILLER WIRE DEVELOPMENT FOR 2195 ALUMINUM-LITHIUM

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